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raise its other End, so as to throw the Catch in again upon the Teeth of the Ratchet, and stop the whole Motion without Accidents.

The 6th *Figure* represents the Wheel and Pinion at the other End of the Axis, where the same Letters express the same Parts.

The 7th Figure represents the Crane with the walking Wheel, the whole turning round upon the strong Post or Puncheon *S*, which is fix'd steadily upright by Means of the Braces and Cills *LLL* *LLL*; and when the Wheel and Pinion is us'd instead of the walking Wheel, all the other Parts are the same.

f F, Is a Brace and Ladder.

E, N, M, F, Pulleys for the Rope to run over, and come to the Weight at *H*.

N. B. Sometimes a Pair of Blocks is applied between *F* and *H*. A small wooden Roof also is applied over the Ends of the Pieces at *E, N, M*, and *F*.

V. Of the Meteor called the Ignis Fatuus, from Observations made in England, by the Reverend Mr. W. Derham, F. R. S. and others in Italy, communicated by Sir Tho. Derham, Bart. F. R. S.

IT being the Opinion of divers skilful Naturalists (particularly Mr. Fr. Willughby and Mr. Ray) that the *Ignis Fatui* are only the Shining of a great Number of the *Male-Glowworms* in *England*, or of the *Pyraustæ* in *Italy*, flying together, I was minded

ed to consult my curious and ingenious Friend, Sir *Tho. Dereham*, about the *Phœnomenon*, being informed, that those *Ignes Fatui* are common in all the *Italian Parts*. But of the *Pyraustæ*, or *Fire-flies*, he saith, *He never observed any such Effects, although there is an immense Number of them in June and July*. He saith moreover, that these *Pyraustæ* are called *Lucciole*, i. e. *Small Lights*, and that they are not the *Farfalls* (as Mr. *Ray* thought) which are *Butter-flies*.

But I have good Reason to think, that Insects are not concerned in the *Ignes Fatui*, from the following Observations; the First of which I made my self, and the others I received from *Italy*, by the Favour of Sir *Tho. Dereham*.

My own Observation I made at a Place that lay in a Valley between Rocky Hills, which I suspect might contain Minerals, in some Boggy Ground near the Bottom of those Hills. Where, seeing one in a calm, dark Night, with gentle Approaches I got up by Degrees within two or three Yards of it, and viewed it with all the Care I possibly could. I found it frisking about a dead Thistle growing in the Field, until a small Motion of the Air (even such as was caused only by the Approximation of my self) made it skip to another Place, and thence to another, and another.

It is now about fifty-five Years since I saw this *Phœnomenon*, but I have as fresh and perfect an Idea of it, as if it was but of a few Days. And as I took it then, so I am of the same Opinion now, that it was a *fixed Vapour*.

The *Male Gloworms* I know emit their shining Light, as they fly; by which Means they discover and

and woo the Females : but I never observed them to fly together in so great Numbers, as to make a Light equal to an *Ignis Fatuus*. And I was so near, that had it been the Shining of Gloworms, I must have seen it in little distinct Spots of Light ; but it was one continuous Body of Light.

Having thus related my own Observations of the *Ignes Fatui*, I shall next give an Account of the Observations which Sir *Tho. Dereham* procured for me in *Italy*, in the following Letter of Dr. *Giacomo Bartholomeo Beccari*, F. R. S. to Sir *T. Dereham*, F. R. S. dated at *Bologna*, Octob. 23, 1728, and translated from the *Italian*, by the late Dr. *Job. Caspar Scheuchzer*. Which Letter is in these Words.

TIS purely in Obedience to your Commands, by Dr. *Eustachio Manfredi*, I send you the following Observations on the *Ignes Fatui*. What I am now going to offer to you concerning these fiery Appearances, is the Result of several Conversations I had upon this Subject with several experienced Travellers, Men of Learning and Reputation, whose Sincerity I had no Reason to mistrust. For my own farther Satisfaction, ever since I received your Commands, I have made it my Busines to speak with as many as I could light of, with such as travelled much in the Mountains, and with others that observed them in Plains, on Purpose to see whether or no the Difference of the Place made any sensible Difference in the Appearance. I find upon the Whole, that they are pretty common in all the Territory of *Bologna*. To begin with the Plains, they are very frequently observed there; the Country Peo- ple

ple call them *Cularsi*, perhaps from some fancied Similitude to those Birds, and because they look upon them as Birds, the Belly and other Parts of which are resplendent like our shining Flies. They are most frequent in watry and morasly Ground, and there are some such Places, where one may be almost sure of seeing them every Night, if it be dark. In the Fields near the Bridge *Della Calcarata*, in a Common belonging to the Parish of *S. Maria in dono*, North of *Bologna*, one of these fiery Appearances is very often observed to move a-cross the Fields, coming from another Bridge, called *Della Fossa quadra*. There is another of them in the Fields of *Bagnara*, almost East of *Bologna*, which scarce ever fails to appear in dark Nights, particularly when it rains, or snows, as also in cold and frosty Weather. Both these, I mean that near the Bridge of *Calcarata*, and that in the Fields of *Bagnara*, are very large; and I am assured, that sometimes their Light is equal to that of one of our ordinary Faggots or Bundles made of Branches of Vines, and that it is scarce ever less than that of the Links which our Country People make of Hemp-stalks, and which they light themselves withal, when they travel at Night. That at *Bagnara* appeared, not long since, to a Gentleman of my Acquaintance, as he was travelling that Way; it kept him Company for a Mile or better, constantly moving before him, and casting a stronger Light on the Road, than the Link he had with him.

I believe there may be many more in other Plains as large as these two, though at present I have not been able to get certain Information of any others. Lesser ones there appear a good many, some of them giving

giving as much Light as a lighted Torch, and some there are no bigger than the Flame of a common Candle. Of these, I have been assured, a good many were seen in the Fields of *Barisella*. All of them have the same Property in resembling both in Colour and Light, a Flame strong enough to reflect a Lustre upon Neighbouring Objects all round. They are continually in Motion, but this Motion is various and uncertain. Sometimes they rise up, at others they sink. Sometimes they disappear of a sudden, and appear again in an Instant in some other Place. Commonly they keep hovering about six Foot from the Ground. As they differ in Largeness, so they do in Figure, spreading sometimes pretty wide, and then again contracting themselves. Sometimes breaking to all Appearance into two, and a very little while after meeting again into one Body ; sometimes floating like Waves, and letting drop some Parts like Sparks out of a Fire. I have been assured, that there is no dark Night all the Year round, when they do not appear. And in the very Middle of the Winter, when the Weather is very cold, and the Ground covered with Snow, they are observed more frequently than in the hottest Summer. The Gentleman who obliged me with an Account of that at *Bagnara*, told me, that if I had a Mind to see it my self, I might be sure of finding it if I went thither in very cold Weather, and in a sharp Frost. Nor doth either Rain or Snow in any wise prevent or hinder their Appearance ; on the Contrary, they are more frequently observed, and cast a stronger Light in rainy and wet Weather. This last Circumstance indeed hath been taken Notice of by some Writers, and among

among the rest, if I remember right, by the learned *Gassendi*. Neither doth the Wind much hurt them, though one should think, that if it was a burning Substance, like common Fire, it should either be diffused in windy Weather, or extinguished by Rain. But since they do not receive any Damage from wet Weather, and since, on the other Hand, it hath never been observed, that any thing was thereby set on Fire, though they must needs in their moving to and fro, meet with a good many combustible Substances, it may from thence be very reasonably inferr'd, that they have some Resemblance to that Sort of Phosphorus which doth indeed shine in the Dark, but doth not burn any thing as common Fire doth. Nor is there any thing extraordinary in this, any more than in other fiery Appearances, which I am informed are likewise pretty common, and agree with the *Ignes Fatui*, in having only the Splendor and Appearance of Fire, without the Quality of Burning, but differ from them in a good many other Particulars. Such a Phænomenon was observed by a noted Clergy-man of this City, one Summer's Evening, near some Country Peoples Houses. The Flame seem'd to him so strong, that he called to them to put it out, for fear it should reach a Hay-loft, and a Heap of Hemp that lay not far from it; but when he came to the very Place where he had first seen the Flame, he perceived that it was only an Appearance, observing not the least Footstep of Fire, though he assured me there lay a good deal of combustible Stuff all thereabouts, which would have easily took Fire, if there had been any thing of an actual Flame upon the Spot. The same Gentleman told me, that in a

very dry Summer (I do not know whether the same with the foregoing) he observed, in the Middle of some other Fields of his own, for several Evenings together, a pretty considerable Flame on the Ground, nearly in the same Place, and that having resolved to go and take a nearer View of it the next Evening, it did not appear for that Time ; that, however, he went to the Place where he had before seen it, and sat himself down on the Ground, but could not observe the least Mark of any Fire or Flame having been in that Spot, nor feel any Heat in the Ground any more than in other Places ; only he saw some slight Flames arising out of the Ground hard by, which disappeared as soon as they came into the open Air. It is well known to People that travel on Horseback at the Beginning of the Night, in the Heat of the Summer, when they traverse the dry Beds of Rivers, and break with their Horses Feet those sandy Grounds that have been all Day long strongly heated by the Sun, there rise up some bluish Flames, which very often fright the Horses. This Phœnomenon is most common in those Places where the Water hath left behind a kind of a chalky Sediment, or fat Earth, which drying, afterwards forms a thick hard Crust. So likewise if in the Heat of the Summer you travel in dark Nights, either on Horseback, or on Foot, over the burnt-up Ground of some Fields, you shall see Flames break out of the Ground almost at every Step. All these Fires and Flames have indeed the Light and Shining, but not the Burning Quality of Fire, whether from the extream Smallness and Rarity of their Parts, as some apprehend, or for some other Reason, I will not attempt to determine. And this is the only Thing they

they have in common with the *Ignes Fatui*, differing very much in other Respects, particularly in not appearing at all Seasons of the Year, and most frequently in the Winter, as the others do. Thus far, what I could learn concerning the *Will with a Wisp*, as it hath been observed in the Plains. As to the Appearance of this Phenomenon in mountainous Parts, by what I have hitherto been able to learn, they differ in nothing else but in Largeness ; and all those I conversed with, that saw them in the Mountains, agree in that they never observed any larger than the Flame of an ordinary Candle. Nor do those that live in the Mountains call them *Cularfi*, which Name is perhaps used only by the Country People in the Plains for those large ones above described. I will make it my Busines to enquire a little farther into this Matter, if perhaps the large ones are seen in the Plains only, and those in the Mountains are always small. The Difference of the Air, and that of the Soil may, for ought I know, contribute a great deal towards the different Size of these Appearances ; at least all that I can offer material at present towards solving this particular Circumstance, with Regard to their Largeness, is, that those Grounds, where we observe the largest Fires, as at *Bagnara*, are what they here call *Strong Ground* (*terreni forti*) being a hard chalky and clayey Soil, which will harbour the Water a long while, and is afterwards, in hot Weather, very apt to break into large Cracks and Fissures ; whereas on the contrary, those Soils in the Mountains, where they observe the small Fires, are what they call soft, or *sweet Ground* (*terreni dolci*) being generally sandy, and of a more loose Contexture, which do not

keep the Water so long as the others. Of that Sort also is the Soil in the abovementioned Plains of *Bari-sella*, where, about seven or eight Years since, they observed a good Number of the smallest *Ignes Fatui* in the Fields, within the Compafs of about three Miles. One Thing I will beg Leave to add, that according to the best Informations I have hitherto been able to procure, these Lights are great Friends to Brooks and Rivers, being frequently observed along the Banks of them, perhaps because the Air carries them thither more easily than any where else. In all other Particulars, as in their Motion, the Manner of their Appearance, their disappearing sometimes very suddenly, their Light, the Height they rise to, and their not being affected either by rainy or cold Weather, they are the very same with the *Cularsi* above described, or the large *Will with a Wisp*, as observed in the Plains.

I intended here to have closed this Account, but I cannot forbear adding the following Observation, which in my Opinion is very curious and singular. I am indebted for it to a young Gentleman, a very accurate and knowing Observer of natural Appearances. Travelling sometime in *March* last, between eight and nine in the Evening, in a mountainous Road not far from our Lady *del Sarfo*, about ten Miles South of *Bologna*, as he approached a certain River called *Rioverde*, he perceived a Light, which shone very strongly upon some Stones that lay upon the Banks. It seemed to be about two Foot above the Stones, and not far from the Water of the River: In Figure and Largenesf it had the Appearance of a *Parallelopiped*, somewhat above a *Bolognese* Foot in Length, and about

about half a Foot high, its longest Side lying parallel to the Horizon: Its Light was very strong, insomuch that he could very plainly distinguish by it Part of a neighbouring Hedge, and the Water in the River; only in the East Corner of it the Light was pretty faint, and the square Figure less perfect, as if cut off, or darkened by the Segment of a Circle. The Gentleman's Curiosity tempted him to examine it a little nearer; in order to which he advanced gently towards the Place, but was surprized to find, that insensibly it changed from a bright Red to a yellowish, and then to a pale Colour, in Proportion as he drew nearer, and that when he came to the Place it self, it was quite vanished. Upon this he stepp'd back, and not only saw it again, but found that the farther he went from it, the stronger and brighter it grew; nor could he upon narrowly viewing the Place where this fiery Appearance was, perceive the least Blackness, or Smell, or any Mark of an actual Fire. The same Observation was confirmed to me by another Gentleman, who frequently travels that Way, and who assured me, that he had seen the very same Light five or six different Times, in *Spring* and *Autumn*, and that he had always observed it in the very same Shape and the same Place, which to me seems very difficult to be accounted for. He told me farther, that once he took particular Notice of its coming out of a neighbouring Place, and then settling it self into the Figure above described. How it comes to pass, that the nearer one approaches to these, or the like fiery Appearances, the fainter they grow, till at last they disappear totally, I very freely own my self at a Loss, but yet I cannot help thinking, that there is something

thing in it analogous to what we observe in Fogs and Clouds, which at a Distance have indeed the Appearance of very thick Bodies, but are found more rare as one gets into them. Nor is it improbable, as they must be something very thin and subtle, that upon the Approach of grosser Bodies with their Atmospheres, they are actually driven away.

This is the Substance of what I have been able to gather from several Accounts relating to the *Ignes Fatui*; but as to the Causes of them, I will not pretend to assign any: I will only add, that all that ever saw any of these fiery Appearances agree, and you may assure Mr. *Derham* of it, that they cast a Light quite different from that of the *shining Flies*; and if you please to reflect on the several Circumstances above related, I believe you will find, that they are not easily, if at all, to be solved by that Hypothesis. I intend in another Letter to trouble you with some Questions, and likewise some Observations of my own on *these Flies*, mean while,

I am, &c.

VI. *Dux*